

5.4 What Is the Ecological Condition of Grasslands and Shrublands?

Grasslands and shrublands include lands in which the dominant vegetation is grasses or other non-woody vegetation, or where shrubs and scattered trees are typical (The Heinz Center, 2002). This ecosystem type includes chaparral, deserts, mountain shrublands, range lands, Florida grasslands, and non-cultivated pastures. Grasslands and shrublands also can be used for grazing, so some land use summaries may include them in estimates of farmlands. Grasslands and shrublands include lands revegetated naturally or artificially to provide a non-crop plant cover that is managed like native vegetation. The vast majority of grasslands and shrublands occur in the western U.S. Collectively, these ecosystems constitute over one-third of the area in the conterminous U.S.

Environmental issues associated with grassland and shrubland ecosystems include introduction of non-native and invasive species, desertification, ground water depletion, and overgrazing. Several federal agencies (e.g., Bureau of Land Management, Forest Service, National Park Service) have responsibility for the majority of publicly owned grasslands and shrublands.

Ecological indicators used in this report for grassland and shrubland ecosystems are listed in Exhibit 5-19. The Heinz report serves as the primary source of information for this ecological resource (The Heinz Center, 2002). The following indicators presented in previous chapters relate to the ecological condition of grasslands and shrublands:

- The *Extent of Grasslands and Shrublands* indicator (Chapter 3, Better Protected Land) reveals that grasslands and shrublands occupy about 861 million acres or just over one-third of the land area in the conterminous U.S. states. Alaska contains about 205 million acres of grasslands and shrublands.

- *Number/Duration of Dry Stream Flow Periods in Grasslands and Shrublands* (Chapter 2, Purer Water) is an important indicator of the hydrology of grasslands and shrublands. This indicator shows that the percentage of no-flow periods has decreased in all grassland and shrubland regions of the West (The Heinz Center, 2002). The percentage of no-flow periods was similar in 1950 and 1960 and then decreased in the 1970s, 1980s, and 1990s. The 1980s was a relatively wet period and experienced some of the smallest percentages of no-flow periods over the 50-year period on record. The duration of zero-flow periods also decreased during the period from the 1970s through the 1990s, compared to the 1950s and 1960s (The Heinz Center, 2002).

The two biotic structure indicators in Exhibit 5-19, described on the following pages, appear for the first time in this chapter: *At-Risk Native Species* and *Population Trends of Invasive and Native, Non-invasive Birds*.

Exhibit 5-19: Grasslands and shrublands indicators

Essential Ecological Attribute	Indicators	Category		Source
Landscape Condition		1	2	
Extent of Ecological System/Habitat Types	Extent of grasslands and shrublands	■		DOI
Landscape Composition				
Landscape Structure/Pattern				
Biotic Condition				
Ecosystems and Communities	At-risk native grassland and shrubland species		■	NatureServe
	Population trends in invasive and native non-invasive bird species	■		DOI
Species and Populations				
Organism Condition				
Ecological Processes				
Energy Flow				
Material Flow				
Chemical and Physical Characteristics				
Nutrient Concentrations				
Other Chemical Parameters				
Trace Organics and Inorganics				
Physical Parameters				
Hydrology and Geomorphology				
Surface and Ground Water Flows	Number/duration of dry stream flow periods in grasslands/shrublands	■		DOI
Dynamic Structural Conditions				
Sediment and Material Transport				
Natural Disturbance Regimes				
Frequency				
Extent				
Duration				

Indicator

At-risk native grassland and shrubland species - Category 2

Native species contribute substantially to the goods and services provided by grasslands and shrublands. These species have evolved in and adapted to the range of environmental conditions that has occurred in grassland and shrubland ecosystems over thousands of years. While species extinction is a natural geologic phenomenon, the extinction of species has increased over the past 100 years (Vitousek, et al., 1997), and many ecologists believe that ecosystem function and resilience is related to biodiversity (Naeem, et al., 1999), so that preserving biodiversity is critical for sustainable ecosystems. Whether or not this is always the case¹⁰ many people believe that more species is preferable to fewer species.

What the Data Show

About 3.5 percent of native grassland and shrubland animal species are critically imperiled, 6 percent are imperiled, and 0.5 percent are or might be extinct (The Heinz Center, 2002) (Exhibit 5-20). When vulnerable species (7 percent) are counted,

about 17 percent of grassland and shrubland animal species are considered "at risk."

Indicator Gaps and Limitations

The data for this indicator are not from a site-based monitoring program, but rather from a census approach that focuses on the location and distribution of at-risk species. Determining whether species are naturally rare or have been depleted is currently not possible. It is not clear that trends can be quantified with any precision.

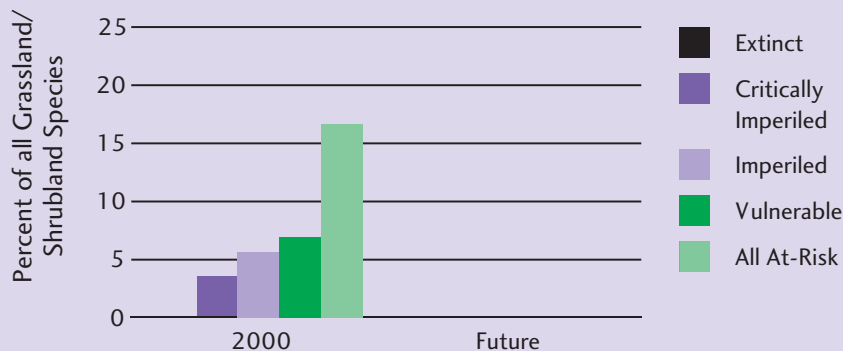
Data Source

The data source for this indicator was *The State of the Nation's Ecosystems*, The Heinz Center, 2002, using data from NatureServe Explorer database. (See Appendix B, page B-42, for more information.)

Exhibit 5-20: At-risk native grassland and shrubland species, by risk category, 2000

Data Not Adequate for National Reporting on Grassland and Shrubland Plants

Partial Indicator Data: Grassland and Shrubland Animals



Coverage: all 50 states.

Source: The Heinz Center. *The State of the Nation's Ecosystems*. 2002.
Data from NatureServe and its Natural Heritage member programs.

¹⁰ An ongoing debate exists within the scientific community on the importance of species diversity in sustaining ecosystem function (Tilman and Downing, 1994; Grime, 1997; Hodgson, et al., 1998; Wardle, et al., 2000)

Indicator

Population trends of invasive and native, non-invasive birds - Category I

Bird species are mobile and can respond quickly to environmental change (The Heinz Center, 2002). The Heinz report uses an indicator of population trends in invasive and non-invasive birds to determine if invasive bird species are increasing more than other bird populations (The Heinz Center, 2002). Invasive species are defined as non-native species (species that are not native to North America or that are now found outside their historic range) that spread aggressively. Some invasive bird species increase when the landscape becomes more fragmented or stress on the ecological system increases. The invasive species considered for grassland and shrublands are believed to be indicative of agricultural conversion, landscape fragmentation due to suburban and rural development, and the spread of exotic vegetation (The Heinz Center, 2002). Native, non-invasive species are considered to reflect relatively intact, high-quality native grasslands and shrublands (The Heinz Center, 2002).

What the Data Show

Since the late 1960s, invasive and non-invasive bird species increased in similar proportions until the period 1996 to 2000, when invasive species increased significantly (The Heinz Center, 2002) (Exhibit 5-21). This increase might represent a short-term fluctuation in bird populations, or it could be a sign of changing ecosystem condition. Continued monitoring of bird populations

and indicators in other essential ecological attributes is required to evaluate these changes.

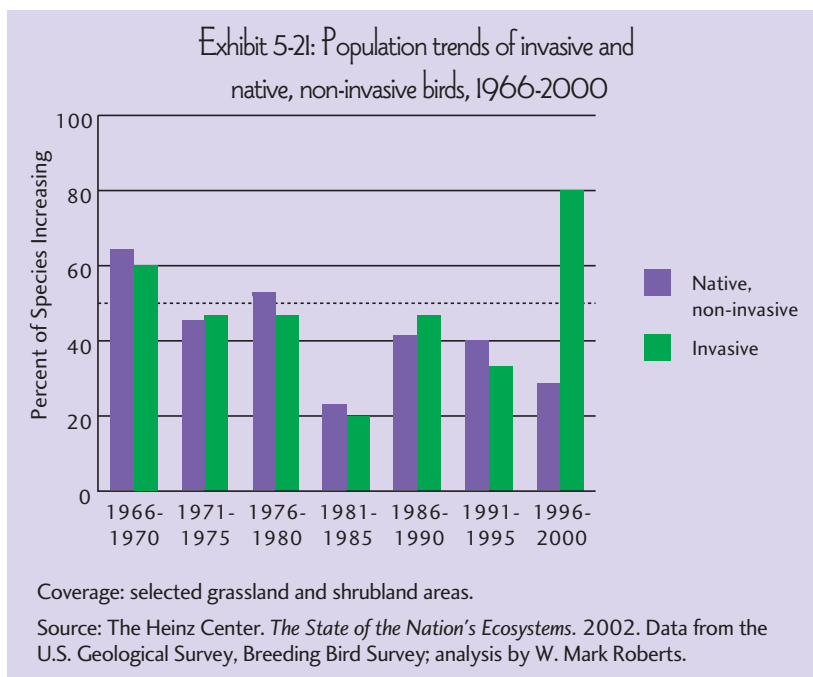
Indicator Gaps and Limitations

The limitations of this indicator include the following:

- The calculation method could mask increases or decreases in particular species. The two groups of birds contain species that differ in their habitats, relative abundance, and range, and bird populations normally fluctuate from year to year. If half the species in one of the groups were to increase and the other half to decrease over a given period, no consistent change would appear for that group (The Heinz Center, 2002).
- The recent period of change is too short to provide an indication of a possible increasing trend in invasive bird species.

Data Source

The data source for this indicator was the Breeding Bird Survey, U.S. Geological Service (1966-2000). (See Appendix B, page B-42, for more information.)



Summary: The Ecological Condition of Grasslands and Shrublands

Grassland and shrubland ecosystems are at risk from the introduction of non-native and invasive species, desertification, ground water depletion, and overgrazing. Few ecological indicators are currently being measured at a national or regional scale, and this situation is unlikely to change in the near future, so the overall ecological condition of the nation's grasslands and shrublands is and will remain effectively unknown.

Landscape condition

The extent of grasslands and shrublands can be estimated from National Land Cover Database (NLCD) information. Grasslands and shrublands occupy about 861 million acres or just over one-third of the land area in the conterminous U.S. Alaska contains about 205 million acres of grasslands and shrublands. This is a diverse group of ecosystems, however, ranging from Florida grasslands to the Mohave desert, and land use information is not readily available for all of them.

Biotic condition

At-risk native species and population trends in invasive and non-invasive birds are two indicators that can provide information on the status of, and change in, biotic condition. About 3.5 percent of native grassland and shrubland animal species are critically imperiled, 6 percent are imperiled, and 0.5 percent are or might be extinct. When vulnerable species (7 percent) are counted, about 17 percent of grassland and shrubland animal species are considered "at risk." However, there is no context in which to interpret the at-risk native species data. The proportion of species that would naturally be rare is unknown. Invasive species are believed to be indicative of agricultural conversion, landscape fragmentation due to suburban and rural development, and the spread of exotic vegetation, whereas native, non-invasive species are considered to reflect relatively intact, high-quality native grasslands and shrublands. Until recently, invasive and non-invasive bird species have changed in similar proportions, but from 1996 to 2000, invasive species increased significantly. This might be a short-term fluctuation in bird populations, or it could be a sign of changing ecosystem condition. Information on stream biota in grasslands and shrublands are needed to be able to assess the condition of grassland and shrubland streams, especially as it may be affected by grazing.

Hydrology and geomorphology

Periods of no flow can certainly be stressful to aquatic communities of grasslands and shrublands, and may indicate harm to the vegetation during drought periods. *The Number/Duration of Dry Stream Flow Periods* indicator has decreased in all grassland and shrubland regions of the West. The percentage of no-flow periods was similar in 1950 and 1960 and then decreased in the 1970s, 1980s, and 1990s. The duration of zero-flow periods also decreased during the period from the 1970s through the 1990s, compared to the 1950s and 1960s. Currently, dry stream flow periods are not monitored nationally.

There were no Category 1 or 2 indicators available for this report for *ecological processes, physical and chemical characteristics, or natural disturbance regimes* for grasslands and shrublands.